# Decision Support Tools for Water Projects

Michael Savage, P.E.

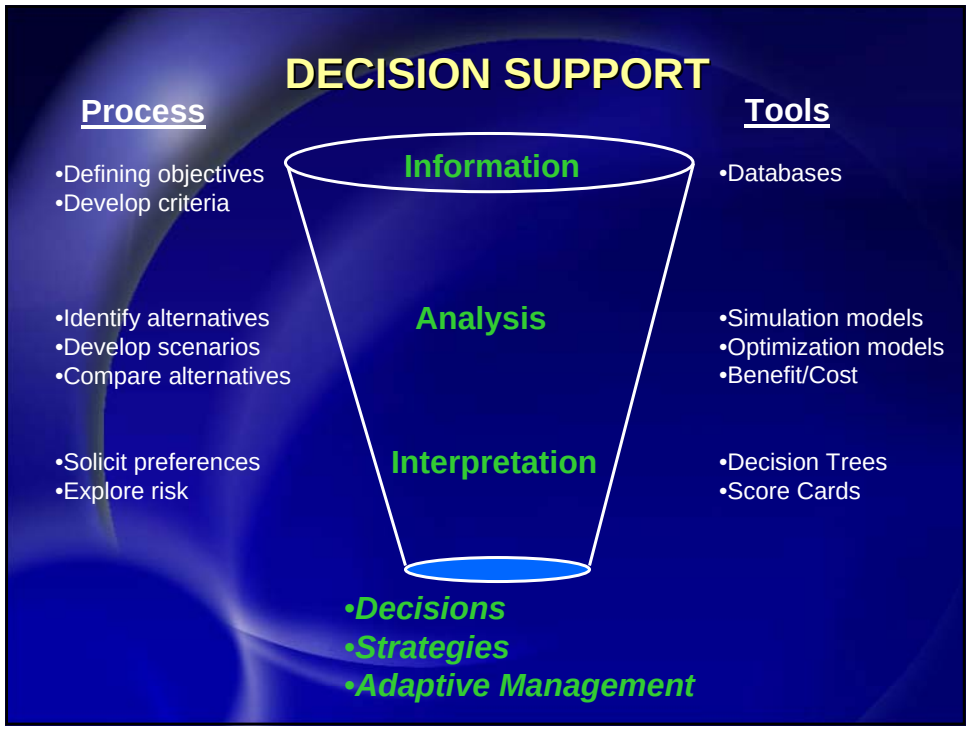
savagemt@cdm.com

May 24, 2004

CDM

## What is Decision Support?

- Process and Tools
  - Process
    - Logical sequence of planning steps
    - Structured series of interactions
    - Meetings, workshops, and other settings in which stakeholders interact
  - Tools
    - Data categorization and display
    - Analytical
    - Interpretative
- Process and Tools for solving problems that are:
  - Too complex for humans alone
  - Too qualitative for computers alone




## Situational Analysis

- What is the current environment of stakeholder interaction?
- What level of technical analysis have been conducted to date?
  - Available Data
  - Tools or models

# Situational Analysis Grid

Most Expensive

Technical Environment

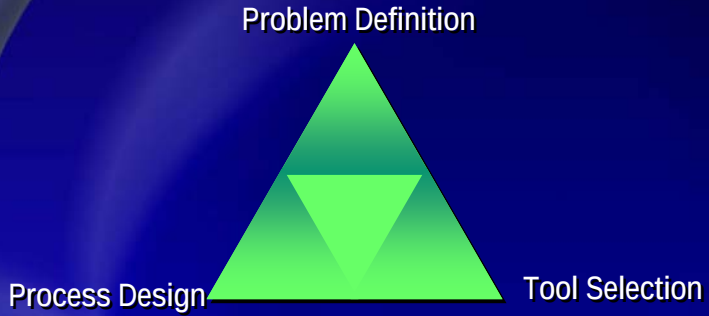
Stakeholder Environment

| | Intense Litigation | Suspicious Distrust | Shared Objectives |
|---|---|---|---|
| Detailed Technical Models | Work it out in court | Emphasis on identification of common objectives and agreed-upon data and tools to move this way | Emphasis on process that applies tools to identify preferred, integrated solutions |
| Technical Challenges | Arbitration by technical expert? Seek a regulatory solution? | Emphasis on understanding objectives and making decisions that establish policy direction (or that set the stage for future, more friendly decision-making) | Emphasis on joint exploration of technical situation – development of tools necessary to understand problem and support decision-making according to objective |
| No Data or Known Relationships | ? | Dialogue process (no tools) | Heavy emphasis on problem definition and front end |

Least Expensive

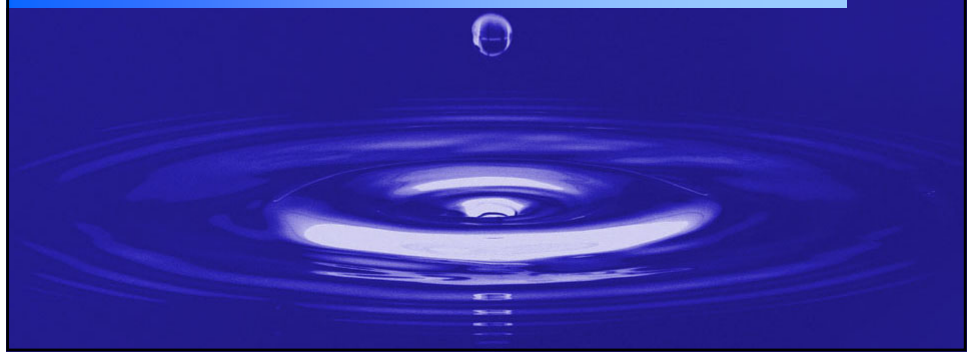
# Applying Your Situational Analysis

*Interrelationship of the problem, the process we apply, and the tools we choose*




*Defining the problem, designing a process, and selecting tools happens no matter where you are on the situational analysis grid*

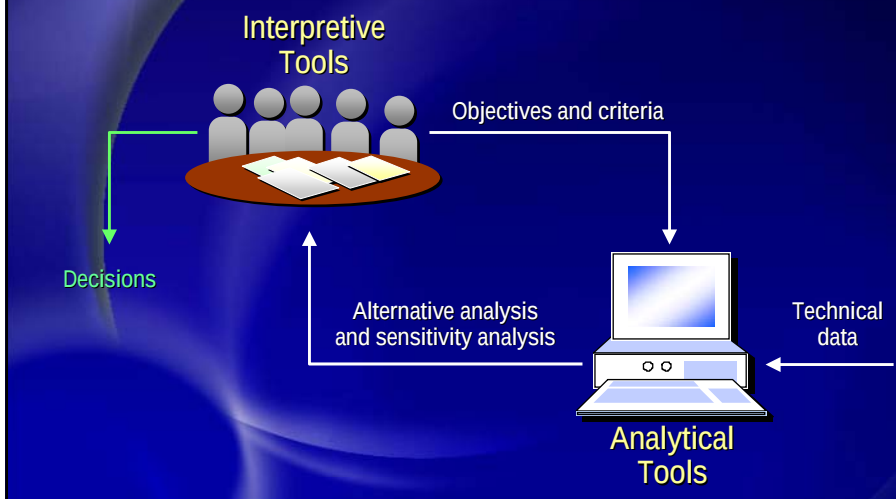
# Incorporating Tools into the Process



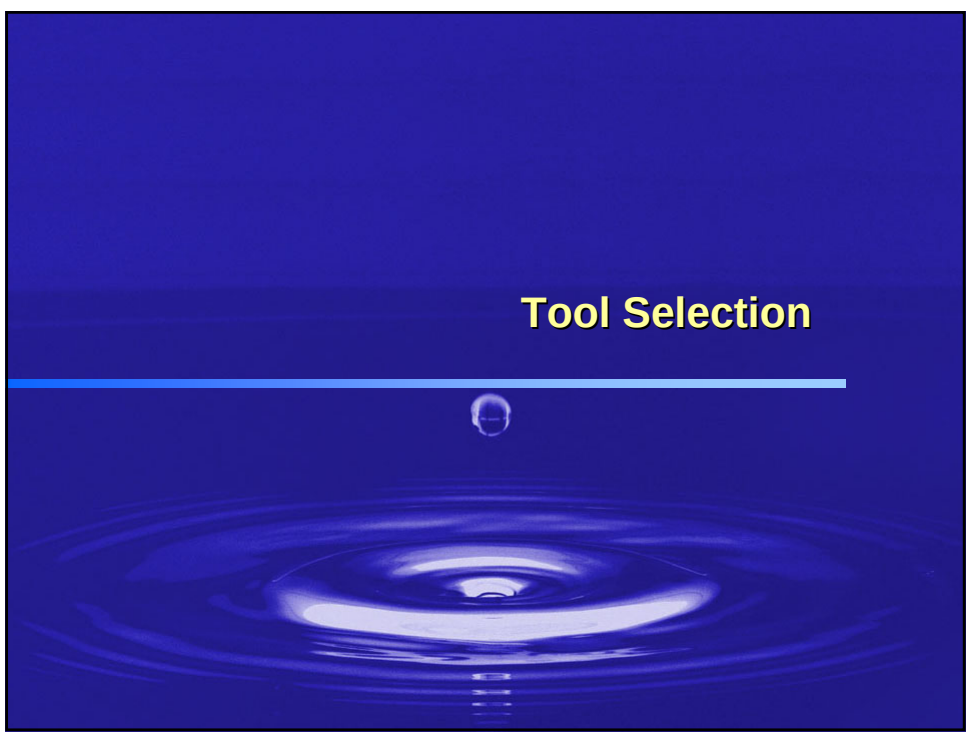
## Categorizing tools

- Data gathering and information
  - Databases
  - GIS
- Analytical Tools
  - Hydrologic & hydraulic models
  - System simulation models
  - Optimization models
- Interpretative Tools
  - Benefit Cost Ratio
  - Decision trees
  - Multi-objective score cards

## Relationship of Interpretive and Analytical Tools




## Tool Selection



## Tool Selection

**Select the tool appropriate for**

- **Planning environment**
- **Accuracy required to make a decision**
- **Decisions to be made**
- **System characteristics**
- **Decisionmaker preference and tolerance: complexity constraint**
- **Project constraints: funding, schedule, resources, information**

## Planning Environment Categories

| Planning Jurisdiction: *What level of the government is involved?* | Planning Scope: *How many functions are included?* | Planning Stage: *What level of planning?* |
|---|---|---|
| 1. International | 1. Multisectoral | 1. Policy |
| 2. Federal | 2. Several Sectors | 2. Framework |
| 2.5 Interstate (regional) | | |
| 3. State | 3. Sectoral | 3. General Appraisal |
| 3.5 Intrastate (regional) | | |
| 4. Local | 4. Several Functions | 4. Implementation |
| 5. Private | 5. Functional | 5. Functional |

*From: Water Resources Planning and Management by Helweg*

## Consequences of not selecting the "right" tool

- Level of detail too low to addresses the objectives and measures
- Cost too high or time frame too analyze to long to address a policy level objective
- Data too limited so that the detailed model requires many unjustified assumptions
- Lack of credibility with stakeholders

## Tools Addressed Today

# Tools Addressed Today

- **Analytical Tools**
  - **Supply-Demand Model -** *Groves*
  - **STELLA (Simulation Model) -** *Rodrigo*
    ***simulation model***
  - **CALSIM Water Transfers Tool -** *Munevar*
    ***systems analysis tool***
  - **CALVIN -** *Lund*
    ***economic-engineering optimization model***
  - **WEAP -***Purkey*
    ***simulation model***
- **Interpretive Tools**
  - **Criterium Decision Plus –** *Swanson & Dowling*
    **Multi-attribute rating technique**
  - **Gaming Tools -** *Bourez*